

LMV331, LMV393, LMV339

General-purpose low voltage comparators

Features

■ Supply operation from 2.7 to 5 V

■ Low current consumption: 20 μA

■ Input common mode range includes ground

■ Wide temperature range: -40°C to +85°C

■ Low output saturation voltage

■ Propagation delay: 200 ns

Open drain output

■ ESD tolerance: 2 kV HBM / 200 V MM

■ SMD packages

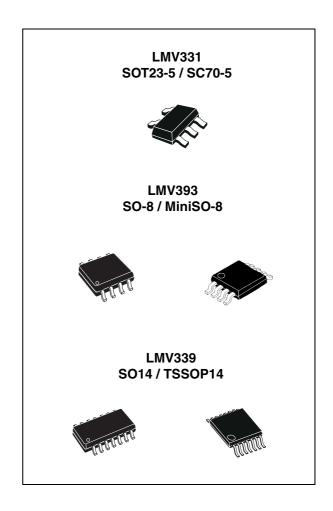
Applications

- Mobile phones
- Notebooks and PDAs
- Battery supplied electronics
- General-purpose portable devices
- General-purpose low voltage applications

Description

The LMV331, LMV393 and LMV339 are the single/dual/quad and low voltage versions of the industry standard LM339 and LM393. They can operate with a supply voltage ranging from 2.7 to 5 V, and exhibit a lower current consumption than their predecessors LM339 and LM393. These devices are a perfect choice for low-voltage applications.

The LMV3xx are available in tiny packages, making them ideal for applications where space saving is a constraint.



The devices are designed to operate in the temperature range of -40°C to +85°C and are suitable for a variety of applications.

1 Package pin connections

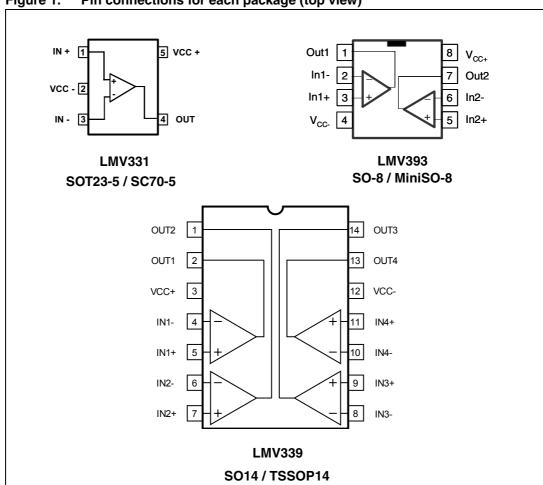


Figure 1. Pin connections for each package (top view)

2 Absolute maximum ratings and operating conditions

Table 1. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V _{CC}	Supply voltage ⁽¹⁾	5.5	V
V _{ID}	Differential input voltage	± 5.5	V
V _{IN}	Input voltage range	(V_{CC}^{-}) - 0.3 to (V_{CC}^{+}) + 0.3	V
V _{out}	Output voltage ⁽¹⁾	5.5	V
R _{thja}	Thermal resistance junction to ambient ⁽²⁾ SC70-5 SOT23-5 SO-8 MiniSO-8 SO14 TSSOP14	205 250 125 190 105 100	°C/W
R _{thjc}	Thermal resistance junction to case ⁽²⁾ SC70-5 SOT23-5 SO-8 MiniSO-8 SO14 TSSOP14	172 81 40 39 31 32	°C/W
T _{stg}	Storage temperature	-65 to +150	°C
T _j	Junction temperature	150	°C
T _{LEAD}	Lead temperature (soldering 10 seconds)	260	°C
	Human body model (HBM) ⁽³⁾	2000	
ESD	Machine model (MM) ⁽⁴⁾	200	V
	Charged device model (CDM) ⁽⁵⁾	1500	Ţ
	Latch-up immunity	200	mA

^{1.} All voltage values, except the differential voltage, are referenced to V_{cc} -.

Table 2. Operating conditions

Symbol	Parameter	Value	Unit
T _{oper}	Operating temperature range	-40 to +85	°C
V _{CC}	Supply voltage -40°C < T _{amb} < +85°C	2.7 to 5.0	V



^{2.} Short-circuits can cause excessive heating. These values are typical.

^{3.} Human body model: a 100 pF capacitor is charged to the specified voltage, then discharged through a 1.5 k Ω resistor between two pins of the device. This is done for all couples of connected pin combinations while the other pins are floating.

^{4.} Machine model: a 200 pF capacitor is charged to the specified voltage, then discharged directly between two pins of the device with no external series resistor (internal resistor < 5 Ω). This is done for all couples of connected pin combinations while the other pins are floating.

Charged device model: all pins and package are charged together to the specified voltage and then discharged directly to ground through only one pin. This is done for all pins.

3 Electrical characteristics

Table 3. $V_{CC}^+ = +2.7 \text{ V}, V_{CC}^- = 0 \text{ V}, T_{amb} = +25^{\circ} \text{ C}, \text{ full } V_{ICM} \text{ range (unless otherwise specified)}^{(1)}$

Symbol	Parameter Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _{IO}	Input offset voltage			1	7	mV
ΔV _{IO}	Input offset voltage drift	-40°C < T _{amb} < +85°C		5		μV/°C
I _{IB}	Input bias current ⁽²⁾	-40°C < T _{amb} < +85°C		25	250 400	nA
I _{IO}	Input offset current ⁽²⁾	-40°C < T _{amb} < +85°C		1	50 150	nA
V.	Common mode input voltage			-0.1		V
V _{ICM}	Common mode input voitage			2.0		\ \ \
V _{OL}	Output voltage low	I _{SINK} = 1 mA		20		mV
I _{SINK}	Output sink current	V _{OUT} = 1.5 V	5	47		mA
I _{CC}	Supply current	No load, output high, V _{ICM} = 0 V		20	100	μΑ
I _{OH}	Output current leakage	-40°C < T _{amb} < +85°C		0.003	1	μА
TP _{HL}	Propagation delay High to low output level	$V_{ICM} = 0 \text{ V}, \text{ R}_L = 5.1 \text{ k}\Omega, \text{ C}_L = 50 \text{ pF}$ Overdrive = 10 mV Overdrive = 100 mV		300 200		ns
TP _{LH}	Propagation delay Low to high output level	V_{ICM} = 0 V, R_L = 5.1 k Ω , C_L = 50 pF Overdrive = 10 mV Overdrive = 100 mV		550 400		ns

^{1.} All values over the temperature range are guaranteed through correlation and simulation. No production tests have been performed at the temperature range limits.

^{2.} Maximum values include unavoidable inaccuracies of the industrial tests.

Table 4. $V_{CC}^+ = +5 \text{ V}, V_{CC}^- = 0 \text{ V}, T_{amb} = +25^{\circ}\text{C}, \text{ full } V_{ICM} \text{ range (unless otherwise specified)}^{(1)}$

Symbol	Parameter	Test conditions	Min.	Тур.	Max.	Unit
V _{IO}	Input offset voltage	-40°C < T _{amb} < +85°C		1	7 9	mV
ΔV_{IO}	Input offset voltage drift	-40°C < T _{amb} < +85°C		5		μV/°C
I _{IB}	Input bias current ⁽²⁾	-40°C < T _{amb} < +85°C		25	250 400	nA
I _{IO}	Input offset current ⁽²⁾	-40°C < T _{amb} < +85°C		2	50 150	nA
V	Common mode input voltage			-0.1		V
V _{ICM}	Common mode input voltage			4.2		V
A_V	Voltage gain		20	50		V/mV
V _{OL}	Output voltage low	I _{SINK} < 4 mA -40°C < T _{amb} < +85°C		50	400 700	mV
I _{SINK}	Output sink current	V _{OUT} < 1.5 V	10	93		mA
I _{CC}	Supply current	No load, output high, $V_{ICM} = 0 V$ -40°C < T_{amb} < +85°C		25	120 150	μА
I _{OH}	Output current leakage	-40°C < T _{amb} < +85°C		0.003	1	μА
TP _{HL}	Propagation delay High to low output level	$V_{ICM} = 0 \text{ V}, \text{ R}_L = 5.1 \text{ k}\Omega, \text{ C}_L = 50 \text{ pF}$ Overdrive = 10 mV Overdrive = 100 mV		375 275		ns
TP _{LH}	Propagation delay Low to high output level	V_{ICM} = 0 V, R_L = 5.1 k Ω , C_L = 50 pF Overdrive = 10 mV Overdrive = 100 mV		550 425		ns

^{1.} All values over the temperature range are guaranteed through correlation and simulation. No production tests have been performed at the temperature range limits.

^{2.} Maximum values include unavoidable inaccuracies of the industrial tests.

Figure 2. Supply current versus supply voltage with output high

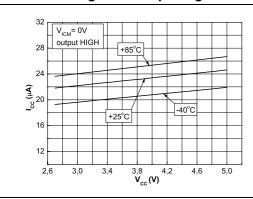


Figure 3. Supply current versus supply voltage with output low

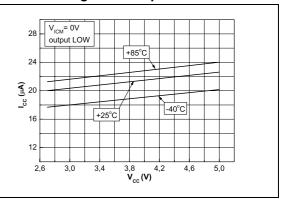


Figure 4. Output voltage versus output current at 5 V supply

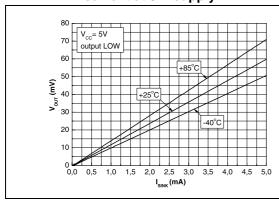


Figure 5. Output voltage versus output current at 2.7 V supply

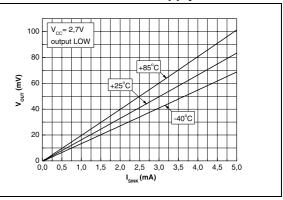


Figure 6. Input bias current versus supply voltage

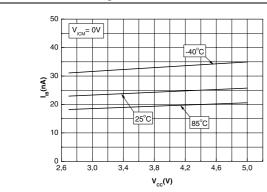
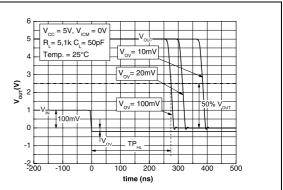


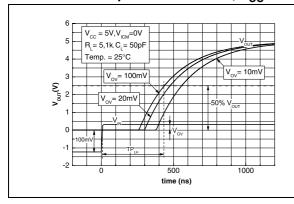
Figure 7. Response time versus overdrive with negative transition, $V_{CC} = 5 \text{ V}$



6/17 Doc ID 16866 Rev 3

Figure 8. Response time versus overdrive with positive transition, $V_{CC} = 5 \text{ V}$

Figure 9. Response time versus overdrive with negative transition, $V_{CC} = 2.7 \text{ V}$



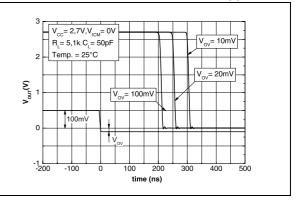
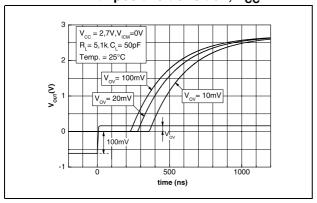


Figure 10. Response time versus overdrive with positive transition, $V_{CC} = 2.7 \text{ V}$



4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK[®] packages, depending on their level of environmental compliance. ECOPACK[®] specifications, grade definitions and product status are available at: www.st.com. ECOPACK[®] is an ST trademark.

4.1 SOT23-5 package

Figure 11. SOT23-5 package mechanical drawing

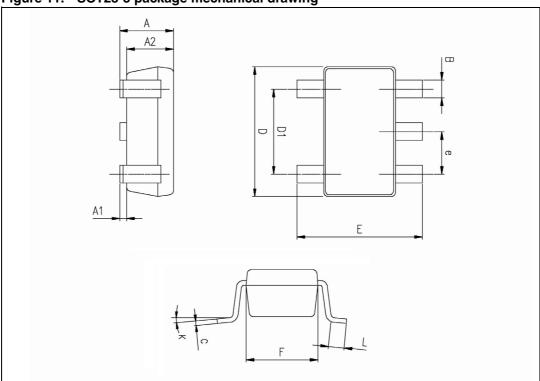


Table 5. SOT23-5 package mechanical data

	Dimensions					
Ref.		Millimeters			Inches	
	Min.	Тур.	Max.	Min.	Тур.	Max.
Α	0.90	1.20	1.45	0.035	0.047	0.057
A1			0.15			0.006
A2	0.90	1.05	1.30	0.035	0.041	0.051
В	0.35	0.40	0.50	0.013	0.015	0.019
С	0.09	0.15	0.20	0.003	0.006	0.008
D	2.80	2.90	3.00	0.110	0.114	0.118
D1		1.90			0.075	
е		0.95			0.037	
Е	2.60	2.80	3.00	0.102	0.110	0.118
F	1.50	1.60	1.75	0.059	0.063	0.069
L	0.10	0.35	0.60	0.004	0.013	0.023
K	0 degrees		10 degrees			

4.2 SC70-5 (SOT323-5) package

Figure 12. SC70-5 (SOT323-5) package mechanical drawing DIMENSIONS IN MM SEATING PLANE E1/2 TOP VIEW PROJECTION

Table 6. SC70-5 (or SOT323-5) package mechanical data

Table 0.	DOTO-5 (of CO1020-5) package incontained data						
	Dimensions						
Ref		Millimeters			Inches		
	Min	Тур	Max	Min	Тур	Max	
А	0.80		1.10	0.315		0.043	
A1			0.10			0.004	
A2	0.80	0.90	1.00	0.315	0.035	0.039	
b	0.15		0.30	0.006		0.012	
С	0.10		0.22	0.004		0.009	
D	1.80	2.00	2.20	0.071	0.079	0.087	
E	1.80	2.10	2.40	0.071	0.083	0.094	
E1	1.15	1.25	1.35	0.045	0.049	0.053	
е		0.65			0.025		
e1		1.30			0.051		
L	0.26	0.36	0.46	0.010	0.014	0.018	
<	0°		8°				

4.3 SO-8 package information

Figure 13. SO-8 package mechanical drawing

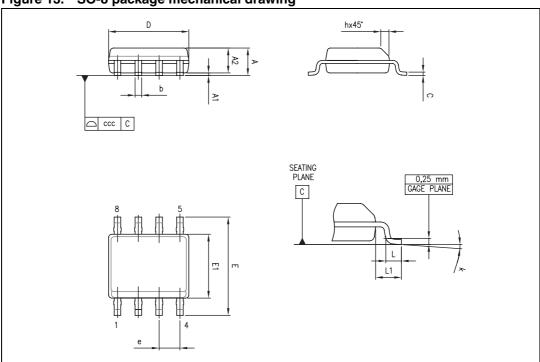


Table 7. SO-8 package mechanical data

	Dimensions							
Ref.		Millimeters			Inches			
	Min.	Тур.	Max.	Min.	Тур.	Max.		
Α			1.75			0.069		
A1	0.10		0.25	0.004		0.010		
A2	1.25			0.049				
b	0.28		0.48	0.011		0.019		
С	0.17		0.23	0.007		0.010		
D	4.80	4.90	5.00	0.189	0.193	0.197		
E	5.80	6.00	6.20	0.228	0.236	0.244		
E1	3.80	3.90	4.00	0.150	0.154	0.157		
е		1.27			0.050			
h	0.25		0.50	0.010		0.020		
L	0.40		1.27	0.016		0.050		
L1		1.04			0.040			
k	0		8°	1°		8°		
ccc			0.10			0.004		

4.4 MiniSO-8 package information

Figure 14. MiniSO-8 package mechanical drawing

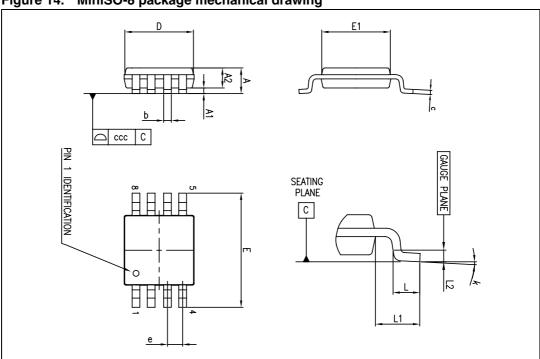


Table 8. MiniSO-8 package mechanical data

	Dimensions					
Ref.		Millimeters			Inches	
	Min.	Тур.	Max.	Min.	Тур.	Max.
Α			1.1			0.043
A1	0		0.15	0		0.006
A2	0.75	0.85	0.95	0.030	0.033	0.037
b	0.22		0.40	0.009		0.016
С	0.08		0.23	0.003		0.009
D	2.80	3.00	3.20	0.11	0.118	0.126
E	4.65	4.90	5.15	0.183	0.193	0.203
E1	2.80	3.00	3.10	0.11	0.118	0.122
е		0.65			0.026	
L	0.40	0.60	0.80	0.016	0.024	0.031
L1		0.95			0.037	
L2		0.25			0.010	
k	0°		8°	0°		8°
ccc			0.10			0.004

4.5 SO-14 package information

Figure 15. SO-14 package mechanical drawing

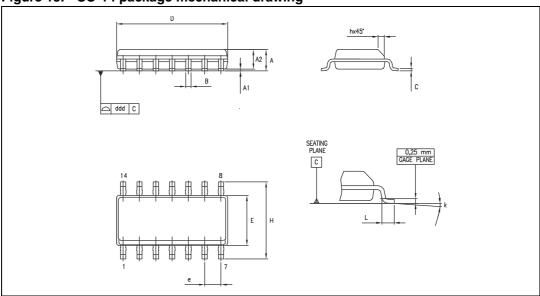


Table 9. SO-14 package mechanical data

	Dimensions							
		Millimeters						
Ref.	Min.	Тур.	Max.	Min.	Тур.	Max.		
Α	1.35		1.75	0.05		0.068		
A1	0.10		0.25	0.004		0.009		
A2	1.10		1.65	0.04		0.06		
В	0.33		0.51	0.01		0.02		
С	0.19		0.25	0.007		0.009		
D	8.55		8.75	0.33		0.34		
E	3.80		4.0	0.15		0.15		
е		1.27			0.05			
Н	5.80		6.20	0.22		0.24		
h	0.25		0.50	0.009		0.02		
L	0.40		1.27	0.015		0.05		
k		8° (max.)						
ddd			0.10			0.004		

4.6 TSSOP14 package information

Figure 16. TSSOP14 package mechanical drawing

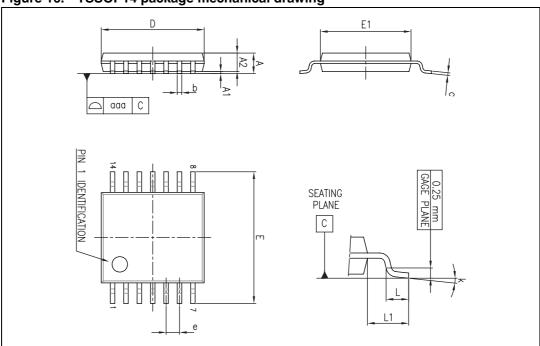


Table 10. TSSOP14 package mechanical data

	Dimensions					
Ref.		Millimeters			Inches	
	Min.	Тур.	Max.	Min.	Тур.	Max.
А			1.20			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.80	1.00	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
С	0.09		0.20	0.004		0.0089
D	4.90	5.00	5.10	0.193	0.197	0.201
E	6.20	6.40	6.60	0.244	0.252	0.260
E1	4.30	4.40	4.50	0.169	0.173	0.176
е		0.65			0.0256	
L	0.45	0.60	0.75	0.018	0.024	0.030
L1		1.00			0.039	
k	0°		8°	0°		8°
aaa			0.10			0.004

5 Ordering information

Table 11. Order codes

Part number	Temperature range	Package	Packaging	Marking
LMV331ILT		SOT23-5		K503
LMV331ICT		SC70-5		K50
LMV393IDT	40°C .85°C	SO-8	Tono 9 rool	3931
LMV393IST	-40°C, +85°C	MiniSO-8	Tape & reel	K508
LMV339IDT		SO14		3391
LMV339IPT		TSSOP14	1	3391

6 Revision history

Table 12. Document revision history

Date	Revision	Changes
08-Dec-2009	1	Initial release.
03-May-2010	2	Corrected Icc unit in Figure 2 and Figure 3.
12-Dec-2011	3	 Added LMV393 and LMV339 devices to the datasheet. Added V_{out} parameter in <i>Table 1: Absolute maximum ratings</i>. Removed note "<i>The magnitude of input and output voltages must never exceed the supply rail ±0.3 V.</i>" from <i>Table 1</i>.

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